



# Semiconductor and Foundry Industry Outlook

**TSMC**

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**October, 2002**

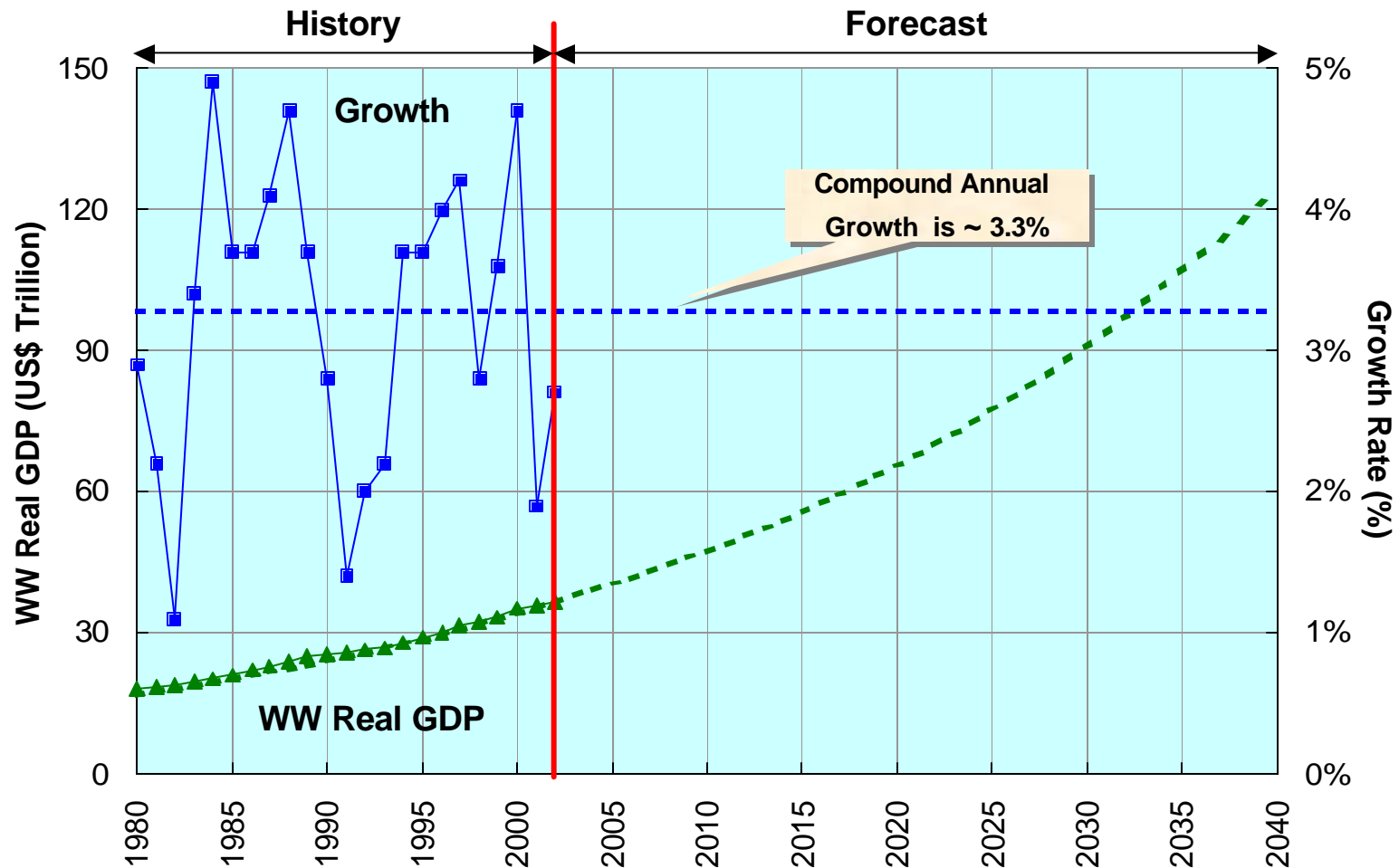
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# Outline

- ✍ **Semiconductor and Foundry Market Growth Forecast**
- ✍ **Foundry Industry Mega Trends**
- ✍ **Conclusion**

# World GDP and Assumption

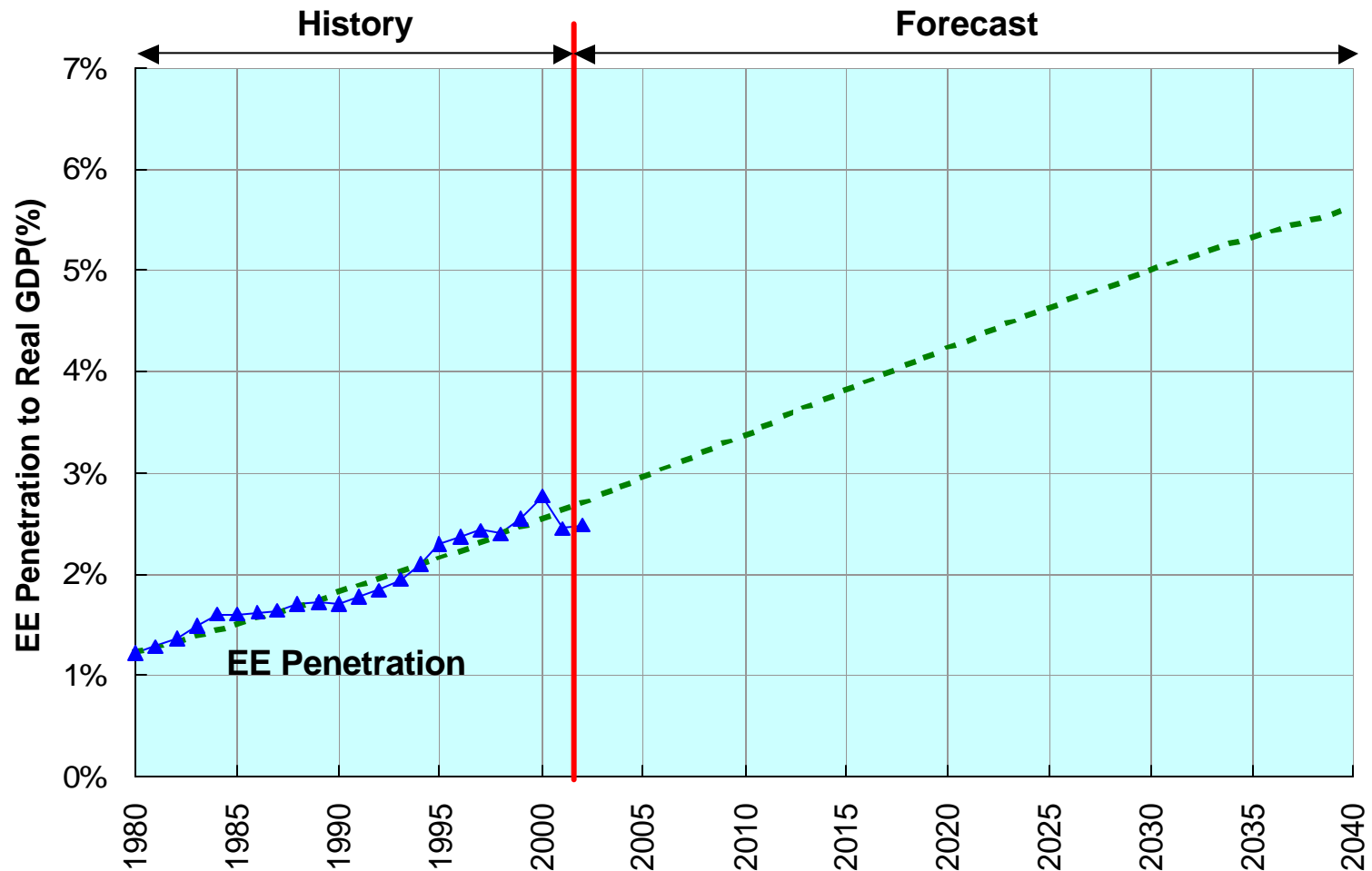


Note: Base year of real GDP is 1995.

Source: IMF 2001; TSMC Estimates



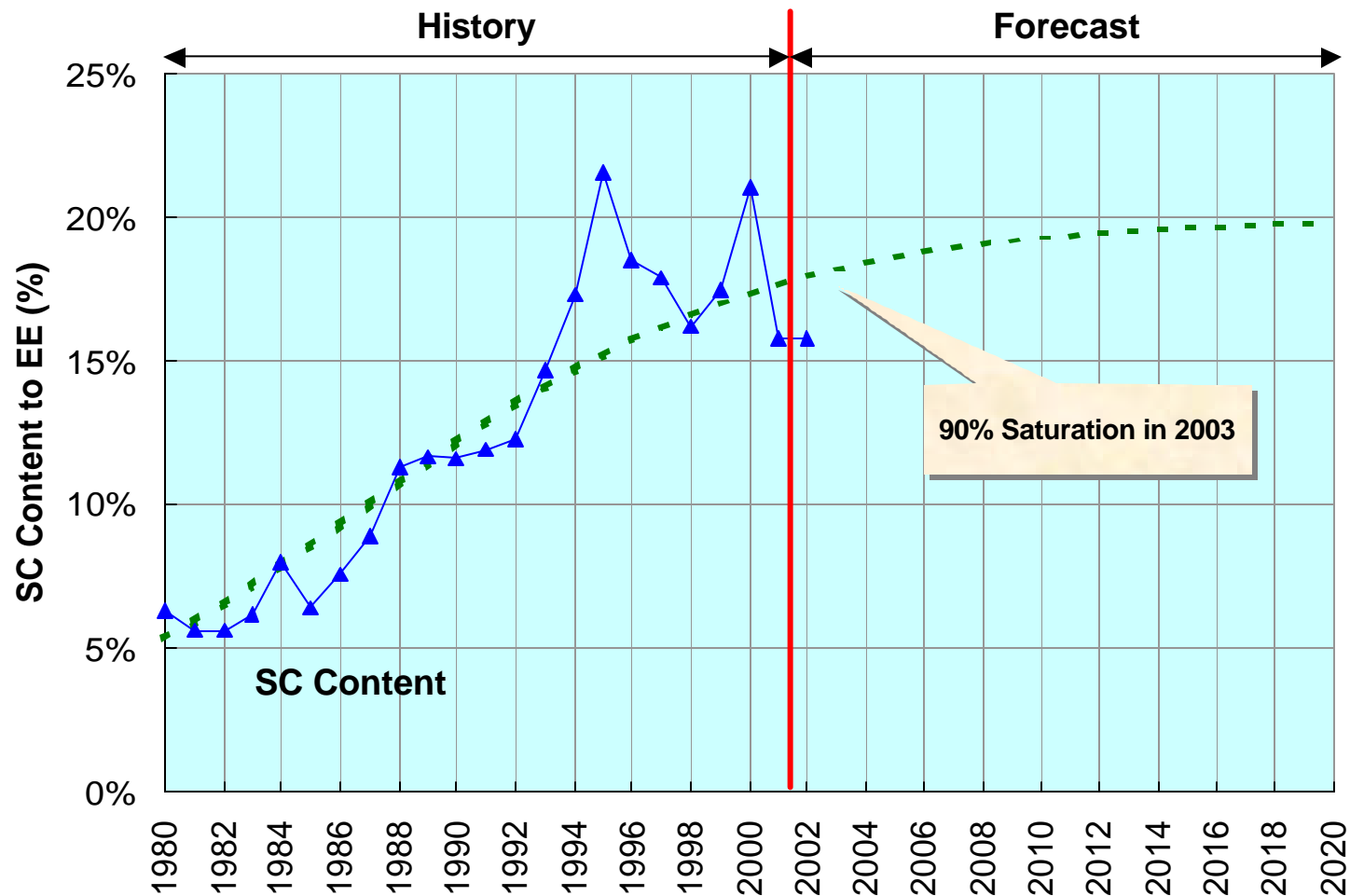
# Electronic Equipment Penetration Assumption



Source: IC Insights 2002; IMF 2001; TSMC Estimates



# SC Content in Electronic Equipment Assumption

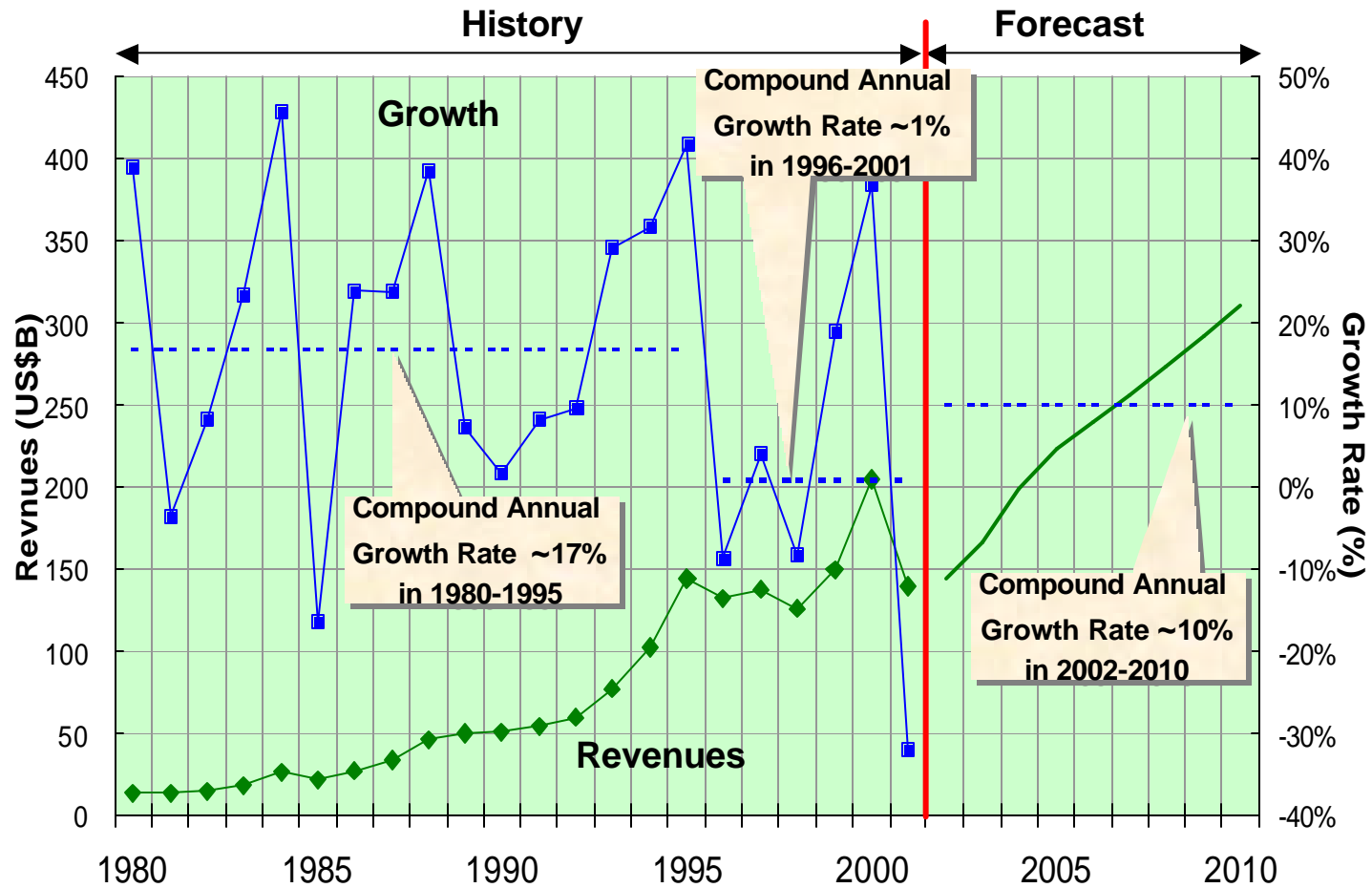


Source: IC Insights 2002; WSTS 2002; TSMC Estimates

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# Semiconductor Market

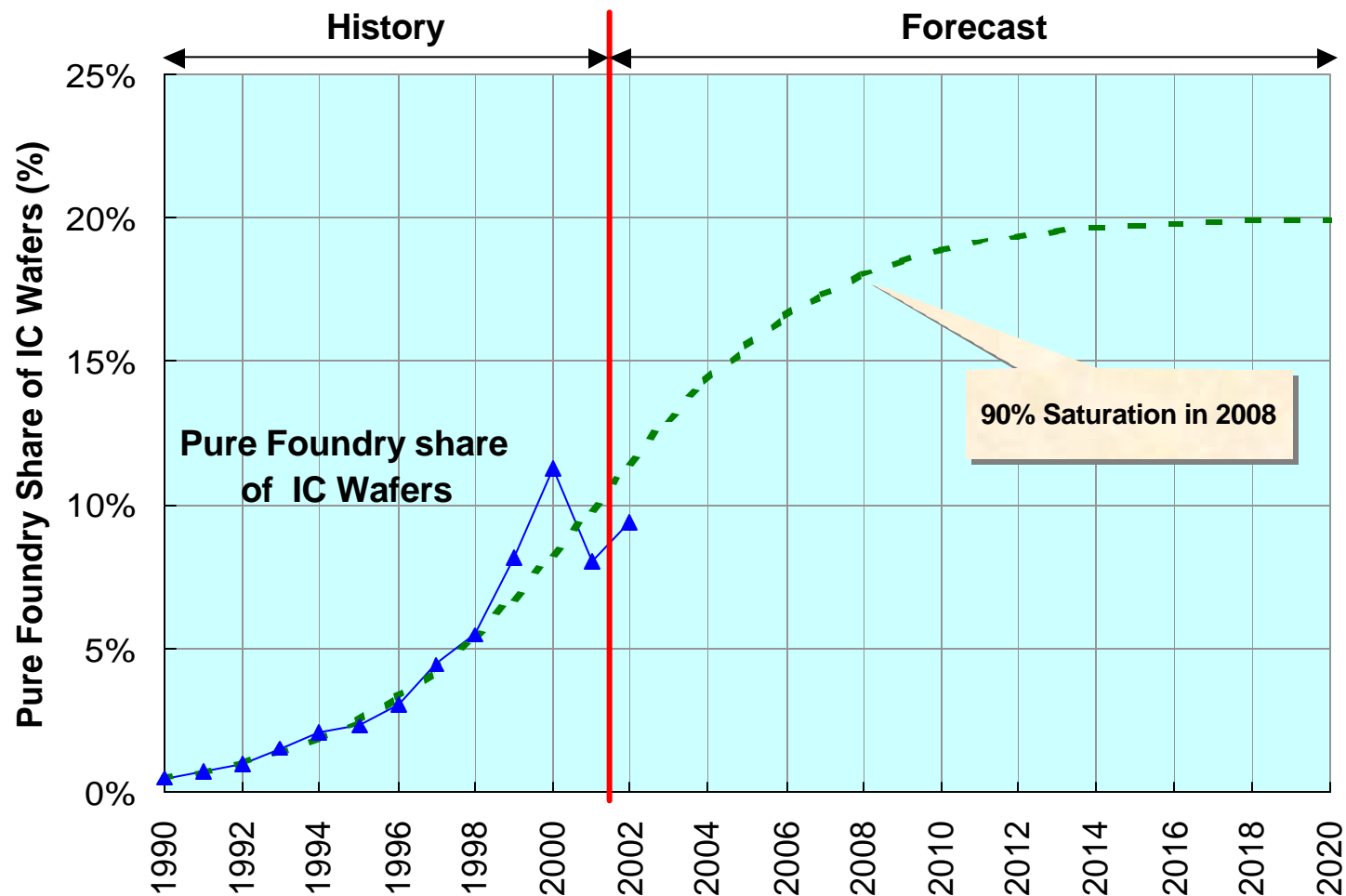


Sources: SIA/WSTS; TSMC Forecasts

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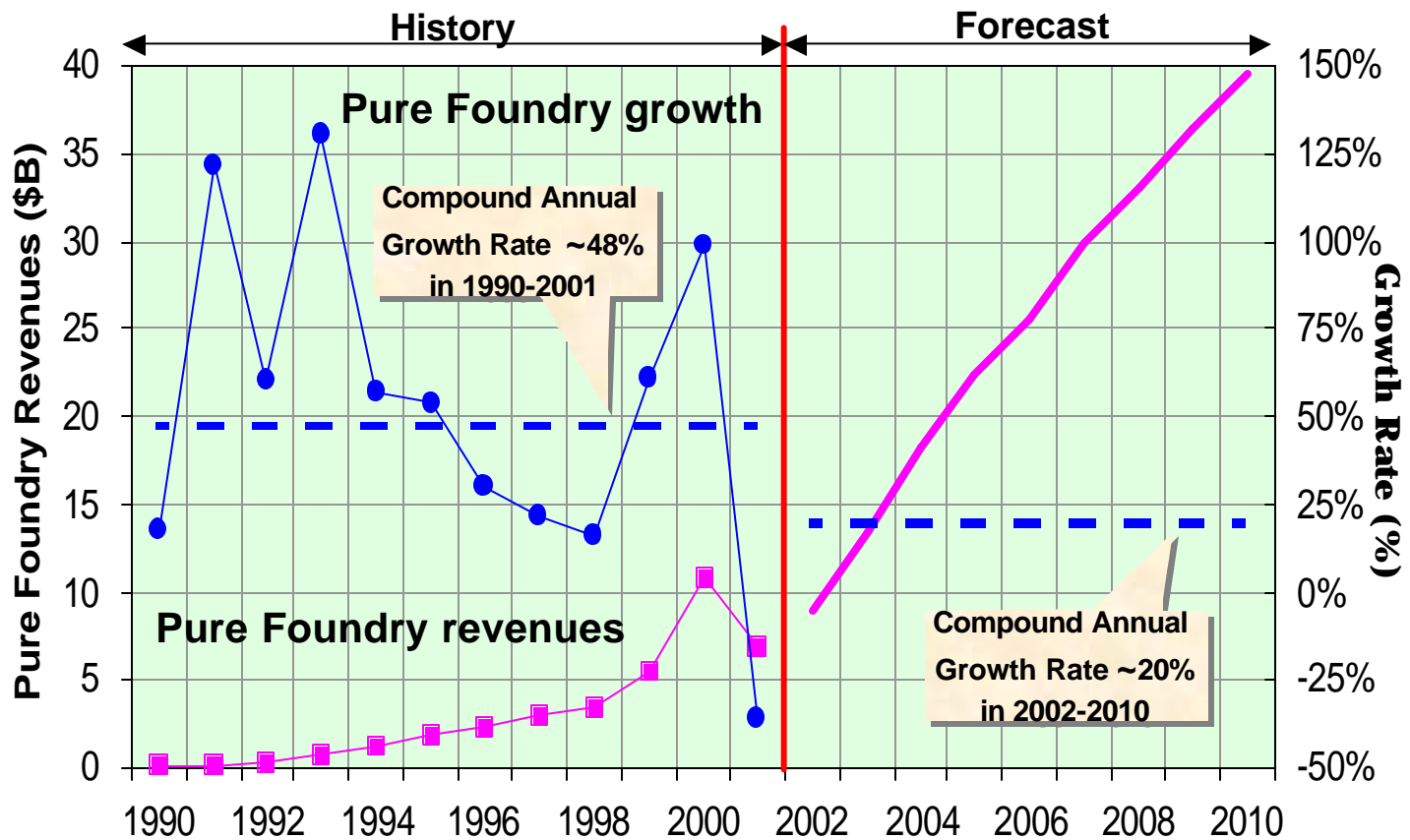


# Pure Foundry Share of IC Wafers Assumption



Source: IC Insights 2002; WSTS 2002; TSMC Estimates

# Pure Foundry Market

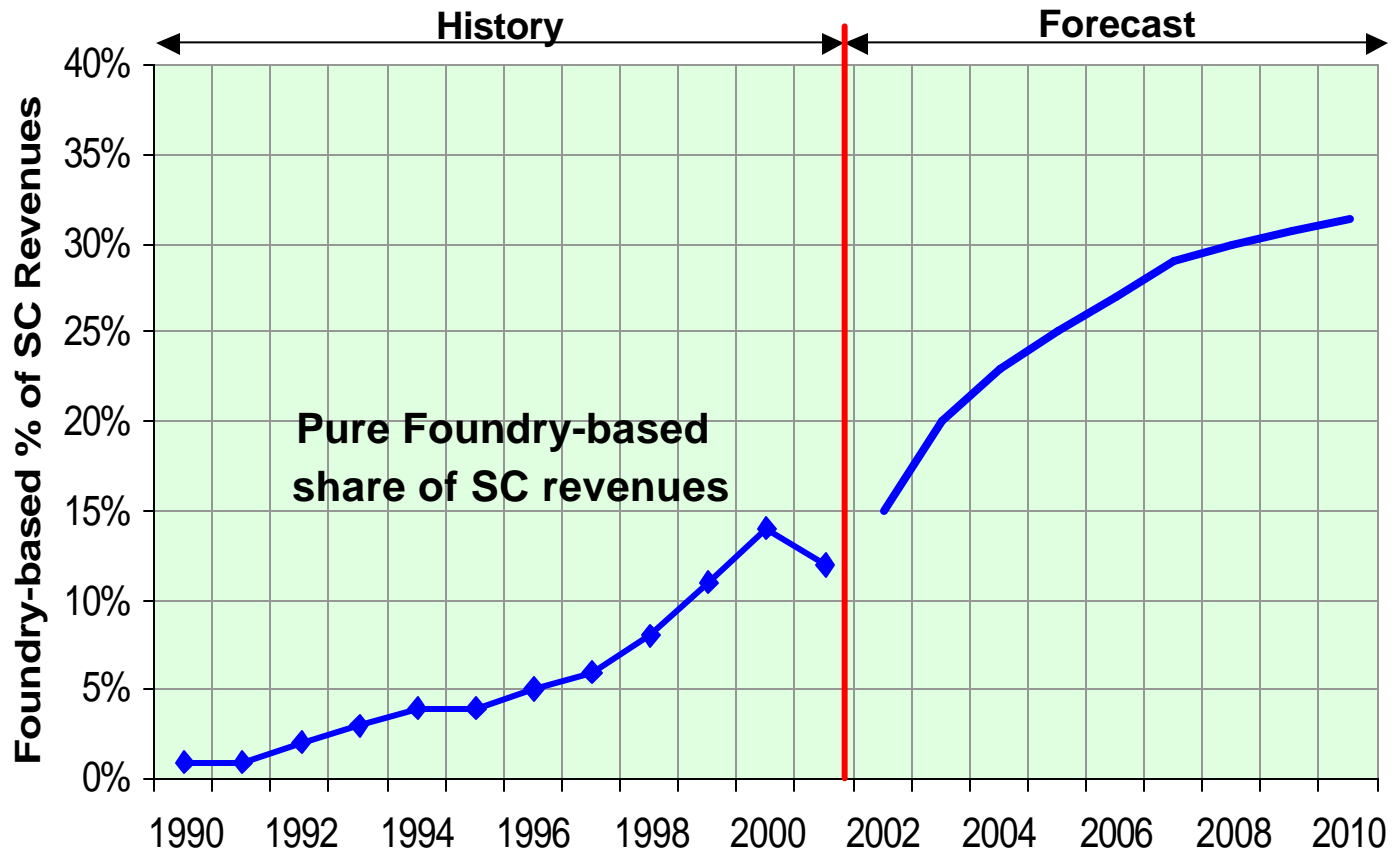


Source: IC Insights 2002; WSTS 2002; TSMC Estimates





# Pure Foundry-based share of SC Revenues



Source: IC Insights 2002; WSTS 2002; TSMC Estimates







## Market Forecast Summary for Yr2002 - 2010

- ✍ Total semiconductor revenue compound annual growth is ~10%
- ✍ Pure foundry revenue compound annual growth is ~20%
- ✍ Pure foundry revenue will reach US\$40B, the corresponding product (not wafer) value represents ~32% of the semiconductor revenue in yr2010.

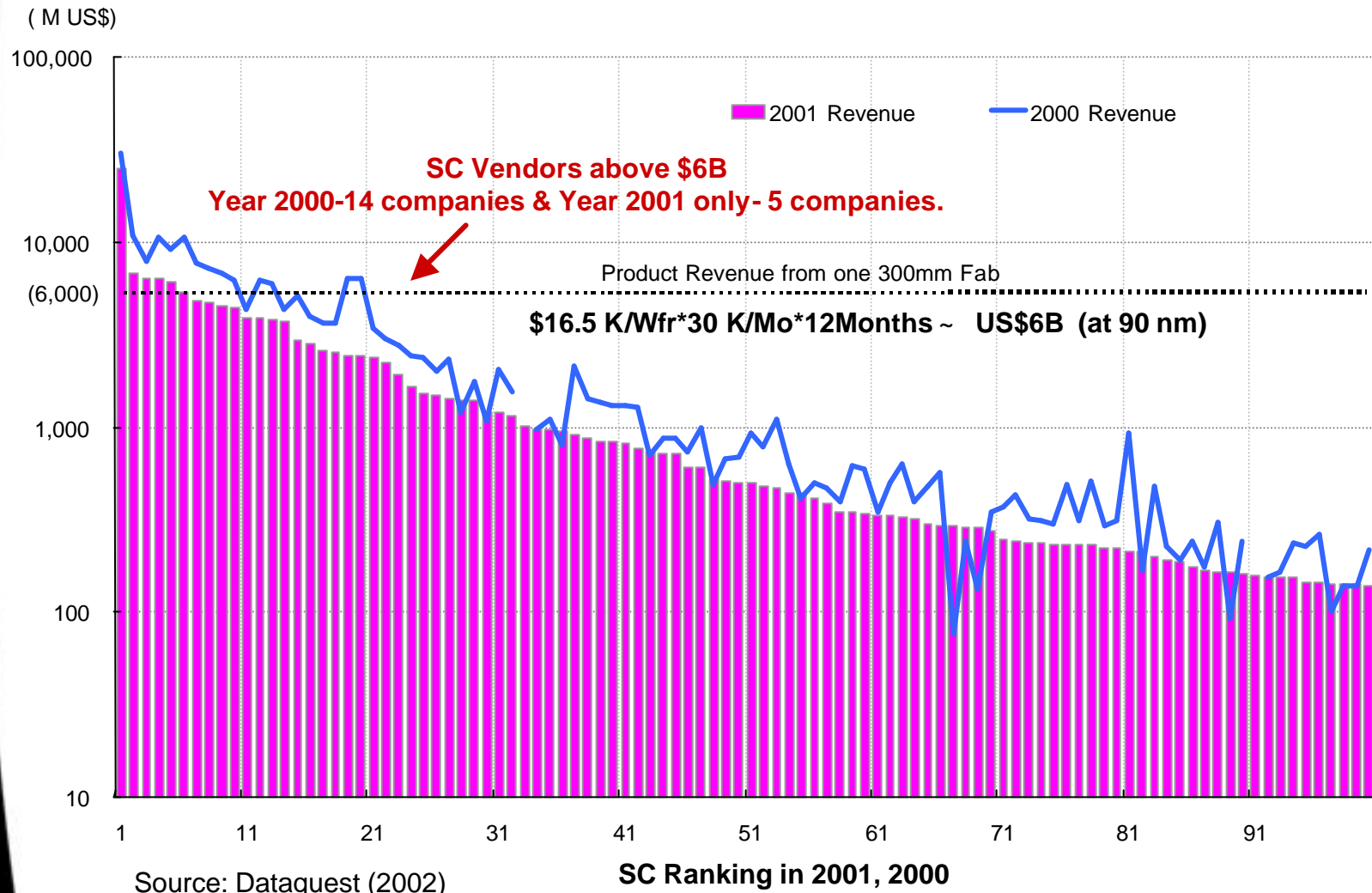


## Foundry Mega Trends

-  **300 mm Transition**
-  **Advanced Technology Development**
-  **Design Infrastructure Establishment**
-  **Design/Process Collaborations**

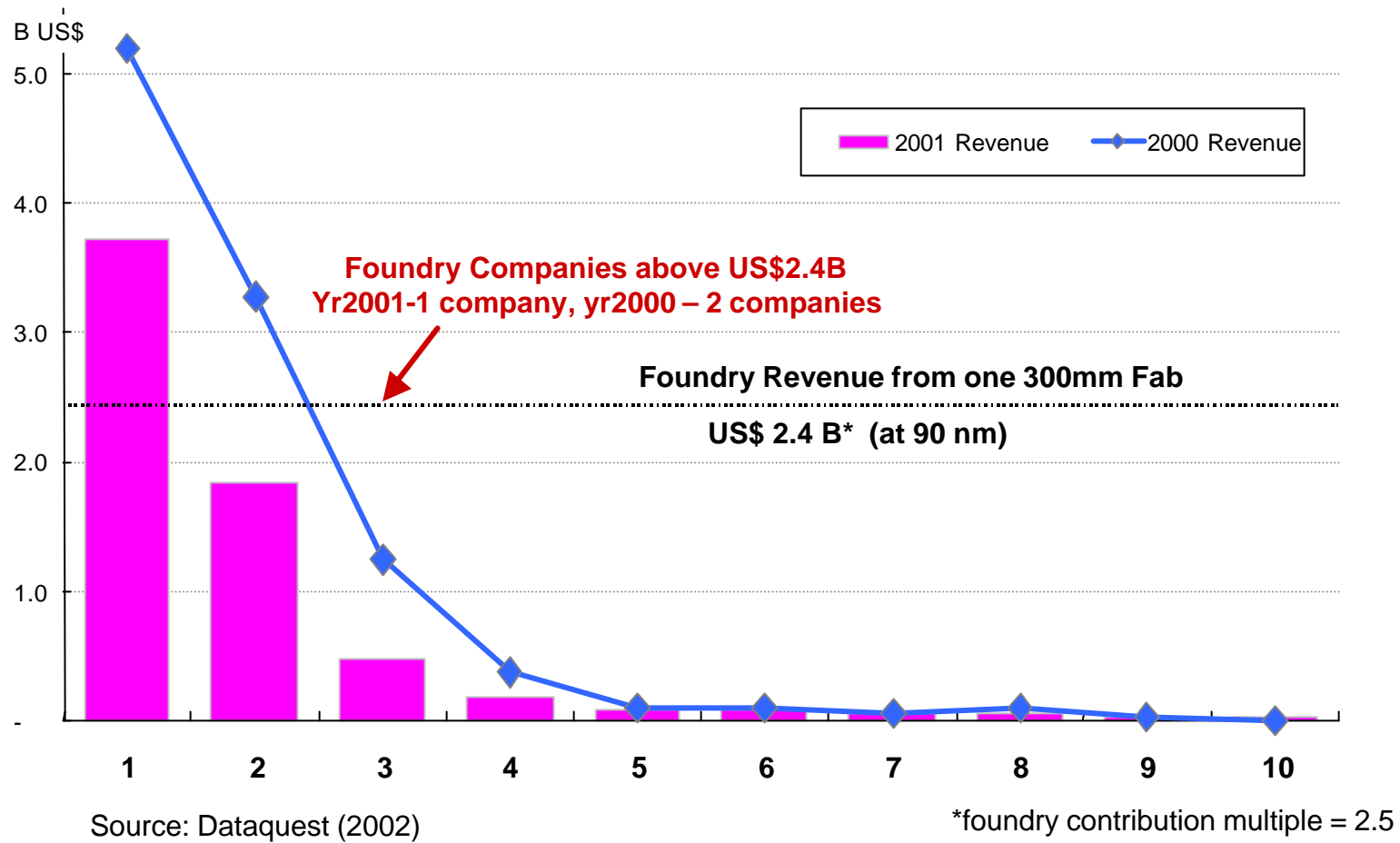


## ***Economy of Scale for Product Company on 300mm Fab***





## Economy of Scale for Foundry on 300mm Fab





## Economy of Scale for 300mm Fab

✍ One single 300 mm fab with 30K wafer/month capacity in 90nm will generate about US\$6B of product revenue, or about US\$2.4B of foundry revenue.

It will also cost about US\$3B

? Only a handful of product companies and 1 or 2 foundries can afford it or need it.

✍ Some joint ventures will be formed, but a JV fab often will not yield the same economy as a single-company fab.



## Advanced Technology Development

- ✍ **Market still demands new technologies in spite of high development cost.**
- ✍ **New technologies will be more expensive and difficult to develop. Only a few leading companies (IDM and foundry) will be able to continue investing in R&D.**



## Design Infrastructure Establishment

- ✍ **Design tools and IP's, sophisticated and expensive, are becoming a big hurdle for the adoption of advanced technologies. Even IDM's have adopted 3<sup>rd</sup>-party tools and IP's.**
- ✍ **Partnership between large foundry and design tool companies can create "technology compliant" design infrastructure**
  - ✍ provides foundry customers the capability and more timely supports in adopting advanced technologies.
- ✍ **Only the foundries and IDM's with the most advanced process technology are the viable partners to EDA tool vendors and IP providers.**





## Design/Process Collaboration

- ✍ It is vital to match design and process in order to have successful products.
- ✍ Design/Process collaboration is under the same roof at IDM's.
- ✍ Foundries and their customers must form close collaborative partnerships.

## Conclusion

- ✍ **Semiconductor industry's growth in the coming decade will be ~10%, slower than the historical ~12%(1980-2001).**
- ✍ **Foundry will continue to grow at average ~20% rate for yr2002-2010 due to faster Fabless growth and IDM's outsourcing.**
- ✍ **Foundry mega trends will lead to one or two large and profitable foundries plus many small struggling ones because of**
  - ✍ **Transition to 300mm wafers**
  - ✍ **Cost of R&D and collaboration with design partners**
  - ✍ **The need to establish design infrastructure, technology compliant EDA tools, IP's**